Subject card

Subject name and code	Machine Learning , PG_00069146					
Field of study	Electrical Engineering, Automation, Robotics and Control Systems					
Date of commencement of studies	February 2025		Academic year of realisation of subject		2025/2026	
Education level	second-cycle studies		Subject group			
Mode of study	Full-time studies		Mode of delivery		at the university	
Year of study	1		Language of instruction		Polish	
Semester of study	2		ECTS credits		3.0	
Learning profile	general academic profile		Assessment form		assessment	
Conducting unit	Department of Intelligent and Decision Support Systems -> Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology					
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Michał Grochowski				
	Teachers					

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	30.0	0.0	45
	E-learning hours included: 0.0						

Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
	Number of study hours	45	5.0	25.0	75

Subject objectives	The aim of the course is to familiarize students with comprehensive knowledge of the dynamically developing field of Machine Learning and to indicate its practical applications in the broadly understood areas of automation and computer science.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U10] is able to apply the known mathematical tools and methods and computer techniques to analyse and evaluate automation and robotics components, devices, systems and systems	Is able to select and implement machine learning methods for the analysis of the quality and efficiency of operation of elements, subsystems, and systems of automation and robotics.	[SU1] Assessment of task fulfilment
	[K7_W05] has knowledge of artificial intelligence computing techniques, inference, learning and solution-finding methods in algorithmic terms applied to automation and robotics systems	Has in-depth knowledge of algorithmic techniques of artificial intelligence, including methods of machine learning, inference, and solution space search, and understands their significance and applications in modern automation and robotics systems.	[SW1] Assessment of factual knowledge

Subject contents	Course content – lecture The course content will be delivered in three thematic blocks: Data analysis, Models and methods of training, Model performance analysis and improvement. 1. Data analysis, including: exploratory data analysis, data grouping and clustering, feature selection and extraction, dimensionality reduction, data normalization, visualization of multidimensional data. 2. Models and methods of training, including: regression models, support vector machines (SVM), neural networks, recurrent neural networks (RNN), deep neural networks (DNN), decision trees, random forests. 3. Model performance analysis and improvement, including: model performance evaluation metrics, regularization techniques, model validation, model hyperparameter tuning.
	Course content – project The theoretical issues and methods discussed during the lectures will be illustrated with examples of their practical applications and implementation methods. Selected topics will be implemented in practice during the project classes, including: - design and implementation of a face recognition system, - design and implementation of a human activity recognition system based on data from wearable fitness devices.

Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Project	50.0%	50.0%
	Lectures	50.0%	50.0%

Recommended reading	Basic literature	Bonaccorso, G. Algorytmy uczenia maszynowego. Zaawansowane techniki implementacji. Helion, 2019 Szeliga, M. Data Science i uczenie maszynowe. Wydawnictwo Naukowe PWN, 2017. Grus, J. Data science od podstaw. Analiza danych w Pythonie. Helion, 2019. Bengio, Y., Courville A., Goodfellow I. Deep Learning. Systemy uczące się. Wydawnictwo Naukowe PWN, 2018. Alpaydin, E. Introduction to Machine Learning. The MIT Press Cambridge, Massachusetts London, Engl
	Supplementary literature	Haykin, S. Neural Networks and Learning Machines (3rd Edition), Prentice Hall, 2009. Bishop C. M. Pattern Recognition and Machine Learning. Springer, 2006. MATLAB Statistics and Machine Learning Toolbox User's Guide, 2021. James, Gareth, et al. An introduction to statistical learning. Vol. 112. New York: springer, 2013. Murphy, Kevin P. Machine learning: a probabilistic perspective. MIT press, 2012.
	eResources addresses	

Example issues/ example questions/ tasks being completed	• Feature exploration and knowledge extraction from large datasets, data normalization, handling of missing data, dimensionality reduction, and visualization of multidimensional data. • A system for identifying athletes activities based on data from wearable fitness devices.
Practical activites within the subject	Not applicable

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